

CLAIMS

Please amend the claims as shown below. All previously presented and original claims have not been changed relative to the immediate prior version except to omit markings that may have been present in the immediate prior version.

Claims 1-4 (Canceled)

Claim 5 (Currently amended) ~~The apparatus of claim 3~~ An apparatus for occluding a coronary sinus vein and removing contrast from blood upstream of an occluded portion of said coronary sinus vein before permitting a remnant of said contrast to enter body circulatory systems via said blood, said apparatus comprising: a catheter having: a balloon tip on one end for insertion into and occlusion of said vein, said balloon tip comprising a bend; and a suction device for removing said contrast by suctioning through said catheter; and a controller for starting and stopping said suction device at specific times; said suction device comprising a syringe for suctioning said contrast through a lumen of said catheter that extends distal to a balloon of said balloon tip, wherein said controller comprises: manual manipulation interface on a plunger of a syringe for beginning and ending suctioning, and visual means for monitoring said vein for determining a presence of said contrast in said vein prior to beginning or ending said suctioning.

Claim 6 (Canceled)

Claim 7 (Currently amended) ~~The apparatus of claim 6~~ An apparatus for occluding a coronary sinus vein and removing contrast from blood upstream of an occluded portion of said coronary sinus vein before permitting a remnant of said contrast to enter body circulatory systems via said blood, said apparatus comprising: a catheter having: a balloon tip on one end for insertion into and occlusion of said vein, said balloon tip comprising a bend; and a suction device for removing said contrast by suctioning through said catheter; and a controller for starting and stopping said suction device at specific times; wherein said catheter comprises a tip with an inflatable balloon thereon, said suction device comprises a pump for suctioning said contrast through a lumen of said catheter having an orifice distal to said balloon and wherein said controller comprises: a manual electrical switch for turning said pump on and off, and visual means for monitoring said vein for determining a presence of said contrast in said vein prior to turning said pump on and off.

Claim 8. (Canceled)

Claims 9-16 (Canceled).

Claim 17. (Previously presented) A method of isolating a substance in a vessel and a volume of a heart and of removing said substance in blood from said vessel and said volume of said heart during angiographic and coronary intervention procedures to lower an amount of said substance that is permitted to enter said heart and systemic circulation of the body, said method comprising: inserting a first catheter having a bend on a distal end through a natural via of said body to said vessel, wherein said first catheter has a means for occluding; inserting a second catheter through another natural via of said body to a location upstream of said vessel; injecting said substance into said location upstream of said vessel; forming an occlusion in said vessel by said means for occluding of said first catheter; suctioning said blood and said substance from said vessel upstream of said occlusion; and removing said occlusion after a majority of said substance has been suctioned out of said vessel; and wherein said first catheter is a balloon tipped catheter and said means for occluding comprises a balloon tip, and wherein said first catheter further comprises a first lumen connected to a first pump and a second lumen connected to a second pump, said first lumen having an orifice distal to said balloon and said second lumen being sealingly connected to said balloon, said first catheter being connected to a controller wherein: said controller actuating at least one of a switch and a timer in said controller for coordinating at least one additional step in said method when a signal is received in said controller; said signal is generated by manually actuating a switch button on said controller when a presence of said substance is seen in said vessel on a fluoroscopy screen.

Claim 18. (Original) The method of claim 17, wherein said first catheter is a balloon tipped catheter and said means for occluding comprises a balloon tip, said steps of occluding and suctioning further comprising: occluding said vessel by inflating said balloon tip of said first catheter at a first predetermined time from 15 minutes before to 3 seconds after said step of injecting; suctioning said substance and blood from said vessel after a second predetermined time from 1 to 2 seconds after said step of injecting; suctioning said substance and blood from said vessel for a third predetermined length of time in the range of 3 seconds to 20 seconds in duration.

Claim 19. (Original) The method of claim 18, wherein: said first predetermined length of time is approximately 1 second; said second predetermined length of time is 2 seconds; and said third predetermined length of time is in the range of 5 to 10 seconds.

Claim 20. (Original) The method of claim 17, wherein said first catheter is a balloon tipped catheter and said means for

occluding comprises a balloon tip, and wherein said first catheter further has a sensor distal to a balloon of said balloon tip and a sensor wire running through said catheter to a controller, said method further comprising: sensing a quantity concentration, or physical characteristic upstream of said means for occluding by said sensor; automatically sending a signal by said sensor to said controller when a predetermined quantity, concentration, or physical characteristic is detected; and actuating by said controller at least one device connected with said controller for coordinating at least one other step in said method when said signal is received.

Claim 21. (Original) The method of claim 20, wherein: said quantity and concentration comprise measures of oxygen or a specific chemical in said substance; said physical characteristic comprises temperature or electrical properties; and said at least one device comprises at least one of an alarm, a switch, and a timer.

Claim 22. (Original) The method of claim 21, wherein said first catheter further comprises a first lumen connected to a first pump and a second lumen connected to a second pump, said first lumen having an orifice distal to said balloon and said second lumen being sealingly connected to said balloon, wherein: said step of sensing further comprises sensing the quantity or concentration of said substance in said vessel by said sensor; said step of actuating by said controller comprising said controller automatically inflating said balloon tip by said second pump and said controller automatically suctioning said substance and said blood by said first pump.

Claim 23. (Canceled)

Claim 24. (Previously presented) The method of claim 17 wherein said controller comprises a plurality of devices comprising a switch for said first pump, a switch for said second pump, at least one said timer, said step of actuating comprising: said controller inflating said balloon by said first pump; said controller suctioning said substance and blood from said vessel by said first pump after a second predetermined length of time measured by said at least one said timer; and said controller turning off said first pump after a third predetermined length of time measured by said at least one said timer.

Claim 25. (Original) The method of claim 17, wherein said first catheter is a balloon tipped catheter and said means for occluding comprises a balloon tip, and wherein said first catheter further comprises a first lumen connected to a first pump and a second lumen connected to a second pump, said first lumen having an orifice distal to said balloon and said second

lumen being sealingly connected to said balloon, said first catheter being connected to a controller wherein said controller comprises a first switch for said first pump and a second switch for said second pump, said method further comprising: manually actuating said second pump by said second switch and thereby inflating said balloon tip at a first predetermined length of time after insertion of said substance in said vessel; manually actuating said first pump by said first switch after a second predetermined length of time after insertion of said substance in said vessel, and thereby suctioning said substance and blood from said vessel; turning off said first pump by said first switch after a third predetermined duration of suctioning, thereby stopping said suctioning; and deflating said balloon tip by actuating said second pump in a reverse direction by said second switch.

Claim 26. (Original) The method of claim 25, wherein said controller further comprises an alarm or a signal to notify said user that said first pump or said second pump should be actuated, said method further comprising: actuating at least one of said pumps in response to said alarm or said signal.

Claim 27. (Original) The method of claim 17, further comprising the steps of: filtering said blood and said substance to remove said substance from said blood; and reintroducing said blood into said body after it has been filtered, wherein a majority of said substance is successfully removed from said blood and prevented from entering a circulatory system of said body.

Claim 28. (Original) The method of claim 17, said step of suctioning further comprising removing from 67 to 99 percent of said substance from said vessel.

Claim 29. (Original) The method of claim 28, said step of suctioning further comprising removing at least 90 percent of said substance.

Claim 30. (Original) The method of claim 17, wherein each of the steps of occluding by inflating, suctioning, and deflating are accomplished by manually manipulating syringes.

Claim 31. (Original) The method of claim 17, wherein said via for said first catheter is a femoral vein from a groin area to a heart of said body.

Claim 32. (Original) The method of claim 17, wherein said via for said first catheter is a jugular vein from a neck to a heart of said body.

Claim 33. (Original) The method of claim 31, wherein said first

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catheter is a balloon tipped catheter and said means for occluding comprises a balloon tip, and wherein said bend is located in said balloon tip, said step of inserting said first catheter further comprising: selectively manipulating said first catheter to guide said balloon tip in a sinuous bath by said bend to engage the balloon tip into said vessel to be occluded.

Claim 34. (Original) The method of claim 33, wherein said bend is C-shaped.

Claim 35. (Original) The method of claim 33, wherein said bend is S-shaped.

Claim 36 (Currently amended). A method of injecting a substance into and removing a substance from a blood vessel of a human body as a primary or a secondary procedure, wherein said substance stays in said vessel temporarily and is removed during said procedure to avoid harmful effects by said substance on said human body, said method comprising the steps of: inserting a first balloon tip catheter percutaneously into said vessel; inserting a second catheter percutaneously into a volume in fluid communication with said vessel; occluding said vessel by a means for occluding on an end of said first catheter; injecting said substance in said volume for natural flow toward said vessel; suctioning said substance in said volume and said vessel by a lumen in said first catheter through an orifice in said catheter distal to said means for occluding; and coordinating the steps of the method by a controller connected to said catheters; wherein the wherein said substance comprises a contrast; wherein the method further comprises imaging said volume and said vessel by angiography while said contrast is present in said volume and said vessel; and wherein said method further comprises selectively repeating said steps of injecting and imaging for imaging from a variety angles and locations as a primary procedure for gathering information about an interior of at least one of said vessel and said volume.

Claims 37-38 (Canceled)

Claim 39 (Previously presented). The method of claim 36, further comprising: selectively repeating said steps of injecting and imaging for imaging from a variety angles and locations as a secondary and complimentary procedure for gathering information about an interior of at least one of said vessel and said volume during a primary coronary intervention procedure on at least one of said volume and said vessel.

Claim 40 (Original) The method of claim 39, wherein said primary procedure is one of mechanical or chemical manipulation, and wherein said steps of injecting and imaging permit assessment of

the primary procedure during said primary procedure.

Claim 41. (Original) The method of claim 39, wherein said vessel is a coronary sinus.

Claim 42. (Original) The method of claim 36, wherein said method further comprises injecting a contrast through said orifice of said first catheter.

Claim 43. (Original) The method of claim 36, wherein said step of injecting comprises injecting a medication for therapeutic purposes on an interior of at least one of said vessel and said volume.

Claims 44-45 (Canceled)

Claim 46. (Currently amended) An apparatus for removing a quantity of an injected substance contrast from an anatomical vessel within the body of a mammalian patient, said apparatus comprising: a catheter having: an occluder for occluding the vessel; a suction device for removing the injected substance contrast from the vessel upstream of the occlusion created by the occluder; and, a controller for starting and stopping said suction device at specific times said controller comprising manual manipulation of a syringe for beginning and ending suctioning and visual means for monitoring said vessel for determining a presence of said contrast in said vessel prior to beginning or ending said suctioning.

Claim 47. (Original) The apparatus of claim 46 wherein the catheter further comprises a lumen that extends through at least a portion of the catheter and has an aperture formed in the catheter upstream of the occluder such that the injected substance can be suctioned through the aperture and through the lumen.

Claim 48. (Canceled)

Claim 49. (Original) The apparatus of claim 46 wherein the occluder comprises a generally C shaped balloon.

Claim 50. (Original) The apparatus of claim 46 wherein the occluder comprises a generally S shaped balloon.

Claim 51. (Currently amended) A method of isolating and removing at least a portion of a quantity of radiographic contrast medium that has been injected into the vasculature of a human or veterinary patient, said method comprising the steps of: A) inserting a first catheter having an occluder into a vessel to be occluded; B) inserting a second catheter to a location upstream

of the occluder; C) injecting contrast into the patient's vasculature upstream of the occluder; D) causing the occluder to occlude the vessel such that at least a portion of the injected contrast medium is retained upstream of the occluder; E) suctioning and removing from the vasculature at least a portion of the contrast medium that is retained upstream of the occluder; and F) causing the occluder to cease occlusion of said vessel; wherein wherein said first catheter further comprises a first conduit connected to a first pump and a second conduit connected to a second pump, said first conduit having a lumen at an end of said tip distal to said balloon and said second conduit being sealingly connected to said balloon, said first catheter being connected to a controller, at least one device in said controller being operative to coordinate other steps in said method when a signal is received in said controller; said at least one device being selected from the ~~group~~ group consisting of an alarm, a switch and a timer; and said signal being generated by manually actuating the controller when the presence of a sufficient amount of contrast is viewed radiographically upstream of the occluder.

Claim 52. (Original) The method of claim 51, wherein Step A comprises inserting a catheter having an occluder that comprises a balloon and wherein Steps D and E further comprise: occluding the vessel by inflating said balloon at a first predetermined time from 15 minutes before to 3 seconds after the injection in Step C; suctioning a fluid and said contrast from said vessel after a second predetermined time from 1 to 2 seconds after said step of injecting; suctioning said fluid and said contrast from said vessel for a third predetermined length of time in the range of 3 seconds to 20 seconds in duration.

Claim 53. (Original) The method of claim 51, wherein said first catheter further comprises a sensor located distal to the occluder and wherein method further comprises the steps of: G) providing a controller which communicates with the sensor; H) using the sensor to sense the presence of a predetermined quantity or concentration of a substance or physical characteristic; I) sending a signal from the sensor to the controller when the sensor senses the predetermined quantity or concentration of said substance or physical characteristic. 54. The method of claim 51, wherein said first catheter further comprises a first conduit connected to a first pump and a second conduit connected to a second pump, said first conduit having a lumen at an end of said tip distal to said balloon and said second conduit being sealingly connected to said balloon, said first catheter being connected to a controller wherein: said controller actuating at least one device in said controller for coordinating other steps in said method when a signal is received in said controller; said at least one device comprises one of an alarm, a switch, and a timer; and said signal is generated by

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manually actuating the controller when the presence of a sufficient amount of contrast is viewed radiographically upstream of the occluder.

Claim 54. (Canceled)

Claim 55. (Currently amended) An apparatus for occluding a coronary sinus vein and removing contrast from blood upstream of an occluded portion of said coronary sinus vein before permitting a remnant of said contrast to enter body circulatory systems via said blood, said apparatus comprising: a catheter having: a balloon tip on one end for insertion into and occlusion of said vein, said balloon tip comprising a bend; and a suction device comprising a pump for removing said contrast by suctioning through said catheter; and a controller for starting and stopping said suction device at specific times; wherein said controller comprises a manual electrical switch for turning said pump on and off, and visual means for monitoring said vein for determining a presence of said contrast in said vein prior to turning said pump on and off.

Claim 56 (Previously presented) The apparatus of claim 55 wherein said suction device comprises a syringe for suctioning said contrast through a lumen of said catheter distal to a balloon of said balloon tip.

Claim 57 (Previously presented) The apparatus of claim 56 wherein said manual electrical switch comprises: manual manipulation interface on a plunger of a syringe for beginning and ending suctioning, and visual means for monitoring said vein for determining a presence of said contrast in said vein prior to beginning or ending said suctioning.

Claim 58 (Previously presented) The apparatus of claim 55 wherein said catheter comprises a tip with an inflatable balloon thereon and said suction device comprises a pump for suctioning said contrast through a lumen of said catheter having an orifice distal to said balloon.

Claim 59 (Currently amended) The apparatus of claim 55 wherein said pump is a first pump and wherein said apparatus further comprises a second pump; and wherein said controller has at least one timer coordinating an injection of said contrast upstream of said vein with an inflation of said balloon, ~~said controller~~; wherein: said at least one timer actuates said second pump and said second pump inflates said balloon at a first predetermined time interval relative to said insertion of said contrast, and said at least one timer actuates said second pump and said second pump deflates said balloon at a second predetermined time interval relative to said insertion of said contrast.

Claim 60. (Previously presented) The apparatus of claim 59 wherein said first predetermined time interval is from 15 minutes before to 3 seconds after injection of said contrast upstream of said vein.

Claim 61 (Previously presented) The apparatus of claim 60 wherein said first predetermined time interval is approximately 1 second.

Claim 62 (Previously presented) The apparatus of claim 59 wherein said at least one timer actuates said first pump to start said suctioning by said first pump after a second predetermined length of time between 1 second and 2 seconds after injection of said contrast upstream of said vein.

Claim 63 (Previously presented) The apparatus of claim 62 wherein said at least one timer stops said first pump after a duration of suctioning in a range from 3 to 20 seconds.

Claim 64 (Previously presented) The apparatus of claim 63 wherein said duration of suctioning is in a range from 5 to 10 seconds.

Claim 65 (Previously presented) The apparatus of claim 63 wherein said bend comprises a C-shape.

Claim 66 (Previously presented) The apparatus of claim 63 wherein said bend comprises an S-shape.

Claims 67-95 (Canceled).